



# Chapter 3: Introduction to SQL

**Database System Concepts, 7<sup>th</sup> Ed.**

©Silberschatz, Korth and Sudarshan

See [www.db-book.com](http://www.db-book.com) for conditions on re-use



# Test for Empty Relations

- The **exists** construct returns the value **true** if the argument subquery is nonempty.
- **exists**  $r \Leftrightarrow r \neq \emptyset$
- **not exists**  $r \Leftrightarrow r = \emptyset$



# Correlation Variables

- Yet another way of specifying the query “Find all courses taught in both the Fall 2009 semester and in the Spring 2010 semester”

```
select course_id
from section as S
where semester = 'Fall' and year= 2009 and
      exists (select *
              from section as T
              where semester = 'Spring' and year= 2010
              and S.course_id= T.course_id);
```

- **Correlated subquery**
- **Correlation name** or **correlation variable**



# Use of “exists” Clause

Product2 (pname, price, cid) Company2 (cid, cname, city)
---

¡Encuentra todas las empresas que fabrican algunos productos con precio <25!

```
SELECT DISTINCT C.cname
FROM Company2 C
WHERE EXISTS (
    SELECT *
    FROM Product2 P
    WHERE C.cid = P.cid
    and P.price < 25
)
```



# Use of “exists” Clause

- Yet another way of specifying the query “Find all courses taught in both the Fall 2017 semester and in the Spring 2018 semester”

```
select course_id
from section as S
where semester = 'Fall' and year = 2017 and
      exists (select *
              from section as T
              where semester = 'Spring' and year = 2018
                  and S.course_id = T.course_id);
```

- **Correlation name** – variable *S* in the outer query
- **Correlated subquery** – the inner query



# Use of “not exists” Clause

Product2 (pname, price, cid) Company2 (cid, cname, city)
---

¡Encuentre todas las empresas que fabrican solo productos con precio <25!

```
SELECT DISTINCT C.cname
FROM Company2 C
WHERE NOT EXISTS (
  SELECT *
  FROM Product2 P
  WHERE C.cid = P.cid
  and P.price >= 25
)
```

```
Select *
From Company2 C, Product2 P
WHERE C.cid = P.cid
and P.price >= 25
```



# Use of “not exists” Clause

- Find all students who have taken all courses offered in the Biology department.

```
select distinct S.ID, S.name
from student as S
where not exists ( (select course_id
                    from course
                    where dept_name = 'Biology')
                  except
                  (select T.course_id
                   from takes as T
                   where S.ID = T.ID));
```

- First nested query lists all courses offered in Biology
- Second nested query lists all courses a particular student took
- Note that  $X - Y = \emptyset \Leftrightarrow X \subseteq Y$
- Note: Cannot write this query using = all and its variants